

REMARKS

The January 21, 2003 Office Action rejects all pending claims 1-33. The present Amendment and Response amends claim 5. After entry of this Amendment, claims 1-33 remain pending in the application. No new subject matter is being added by this Amendment.

Claim Rejections

As discussed in more detail below, Applicants submit that all pending claims are patentable over the cited references because no combination of the references teaches or suggests a method or an apparatus for *polishing a surface* of a workpiece comprising low-k material. Furthermore, with respect to the various claim rejections, no combination of the cited references teaches or suggests any operating parameters or equipment portions for *polishing a workpiece surface* comprising low-k material.

Claims 1-9, 26-29 and 32-33 stand rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 6,409,580 B1, issued to Lougher et al. on June 25, 2002 (hereinafter "Lougher et al.") in view of United States Patent No. 6,054,769, issued to Jeng on April 25, 2000 ("Jeng"). Applicants traverse this rejection.

Lougher et al. generally discloses a method and apparatus for conditioning a polishing surface. Lougher et al. does not disclose any workpieces with low-k material and therefore does not disclose or suggest any particular apparatus or portions thereof for removing material from a workpiece comprising low-k material.

Jeng discloses a workpiece including low-k dielectric material. According to Jeng, the low-k material is selectively placed in desired areas by spinning the low-k material onto the workpiece surface and removing any excess material by *etching* (column 3, lines 4-6 and column 4, lines 33-34). Jeng further discloses that due to poor adhesion and other problems associated with low-k material, intermetal dielectric is deposited over the low-k material and polished or planarized (column 3, lines 11-16). Thus, Jeng teaches that polishing can be used for non-low-k dielectric materials, but it is not suitable for low-k materials. Accordingly, Jeng teaches away from the claimed invention and therefore cannot be combined with another reference to teach or suggest the claimed invention.

No combination of Lougher et al. and Jeng renders obvious claim 1 or any of claims 2-9 that depend therefrom because the references do not teach or suggest "An apparatus for polishing a surface of a workpiece, the surface including a low dielectric constant material" or, as the Examiner acknowledges, "a platen configured to orbit about an axis at a speed up to about 2000 revolutions per minute." Accordingly, claim 1 and claims 2-9 that depend therefrom are not obvious over Lougher et al. in view of Jeng and Applicants therefore request that the Examiner reconsider and withdraw this rejection.

Claims 2, 4-6 and 9 are additionally allowable over Lougher et al. in view of Jeng. Claim 2 is additionally allowable over the cited references because neither reference teaches or suggests "platen is configured to orbit at about an axis at about 1000 orbits per minute." Claim 4 is additionally allowable over the references because neither reference teaches or suggests "an orbital radius of about 0.25 to about 1 inch." Claims 5 and 6 are additionally allowable over Lougher et al. and Jeng because neither reference teaches or suggests "platen...configured to move the workpiece relative to the polishing surface at a speed of about 0.8 to about 3.2 meters per second" as set forth in claim 5 or "the carrier is configured to apply about 0.25 to about 2 pounds per square inch pressure to the workpiece in the direction of the polishing surface" as set forth in claim 6.

Claim 26 is not obvious over Lougher et al. in view of Jeng because no combination of the references teaches or suggests "A method for removing material from a surface of a workpiece, including low-k material" or "providing a workpiece comprising low-k material" or "placing the workpiece comprising low-k material in contact with a polishing surface" or "orbiting the polishing surface at a speed about 500 to about orbits per minute." Furthermore, because Lougher et al. does not teach or suggest any means for removing material from a surface of a workpiece comprising low-k material, it would not be obvious for one skilled in the art to form the invention set forth in claim 26 and claims 27-29 that depend therefrom from the teachings of Lougher et al. in combination with Jeng that only teaches *etching* low-k material. Accordingly, Applicants request that the Examiner reconsider and withdraw the 35 U.S.C. §103(a) rejection to claims 26-29.

Claims 32 and 33 are similarly patentable over Lougher et al. and Jeng because neither reference teaches or suggests "a workpiece carrier proximate the polishing surface, wherein the platen and the workpiece carrier are configured such that the surface of the workpiece comprising a low dielectric constant material and the platen move at a relative speed of about

0.8 to about 3.2 meters per second” as set forth in claim 32 or “A method for removing material from a surface of a workpiece, including low-k material” or “providing a workpiece comprising low-k material” or “placing the workpiece comprising low-k material in contact with a polishing surface” or “moving the polishing surface and the workpiece comprising low-k material relative to each other at a speed of about 0.8 to about 3.2 meters per second” as set forth in claim 33. Applicants therefore request that the Examiner withdraw this rejection to claims 32 and 33.

Claim 10 stands rejected under the 35 U.S.C. §103(a) as being unpatentable over Lougher et al. in view of Jeng and in further view of United States Patent No. 6,241,593 B1, issued to Chen et al. June 5, 2001 (hereinafter “Chen et al.”). Applicants traverse this rejection.

Chen et al. generally discloses a carrier head, including a bladder, for use with a rotary platen polishing apparatus. Nowhere does Chen et al. teach or suggest that the polishing head disclosed in Chen et al. could be used with a polishing apparatus including an orbiting polishing station or polishing a workpiece comprising low-k material. Thus, it would not be obvious to one skilled in the art to combine Lougher et al. and Jeng with Chen et al., and even if the references were combined, the combination of the references does not teach or suggest each and every element of claim 1, from which claim 10 depends. Specifically, no combination of the references teaches or suggests “An apparatus for polishing a surface of a workpiece, the surface including a low dielectric constant material” or “a platen configured to orbit about an axis at a speed up to about 2000 revolutions per minute.” Accordingly, claim 10 is allowable over the cited references and Applicants respectfully request that the Examiner withdraw this rejection to claim 10.

Claims 11, 30, and 31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Lougher et al. as modified by Jeng in view of United States Patent No. 6,416,384 B1, issued to Kawamoto et al. July 9, 2002 (hereinafter “Kawamoto et al.”). Applicants traverse this rejection.

Similar to Chen et al., Kawamoto et al. only discloses a polishing apparatus including a rotating polishing table. Nowhere does Kawamoto et al. teach or suggest an orbiting polishing apparatus or how one could combine the rotary platen teachings of Kawamoto et al. with the orbiting polishing apparatus of Lougher et al. to form the claimed invention. Furthermore, even if Chen et al., Kawamoto et al. were combined with Jeng, the combination does not teach each and every element of the claimed invention. Specifically, the combination does not teach or

suggest “An apparatus for polishing a surface of a workpiece, the surface including a low dielectric constant material” or “a platen configured to orbit about an axis at a speed up to about 2000 revolutions per minute” as set forth in claim 1, from which claim 11 depends or “A method for removing material from a surface of a workpiece, including low-k material” or “providing a workpiece comprising low-k material” or “placing the workpiece comprising low-k material in contact with a polishing surface” or “orbiting the polishing surface at a speed about 500 to about orbits per minute” as set forth in claim 26, from which claims 30 and 31 depend. Accordingly, Applicants request that the Examiner reconsider and withdraw this rejection to claims 11, 30, and 31.

Claims 12-17, 20 and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen et al. in view of United States Patent No. 6,036,582, issued to Aizawa et al. on March 14, 2000 (hereinafter Aizawa et al.) in further view of Jeng. Applicants traverse this rejection.

Aizawa et al. generally discloses a chemical mechanical polishing apparatus divided into a plurality of rooms cleaned to different degrees. Nowhere does either Aizawa et al. or Chen et al. teach or suggest any polishing apparatus or technique for removing material from a workpiece including low-k material as set forth in independent claims 12 and 25. Several of the limitations of these claims as well as the respective dependent claims are directed to apparatus or process techniques designed to remove particular material from a surface of a workpiece including low-k material. Because neither Aizawa et al. nor Chen et al. teach or disclose apparatus or method for removing material from a workpiece that includes low-k material and Jeng only teaches removing low-k material using an *etch process*, no combination of the references renders obvious any of Applicants' claims directed to removing material from a workpiece including low-k material. Furthermore, as the Examiner acknowledges, no combination of the references teaches or suggests a “platen configured to move relative to a workpiece surface at about 0.8 to about 3.2 meters per second and a workpiece carrier configured to apply about 0.25 to about 2 psi to a workpiece in the direction of the platen” as set forth in claim 25. Accordingly, Applicants request that the Examiner withdraw this rejection to claims 12-17, 20, and 25.

Claims 18, 19, 22, and 24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen et al. as modified by Aizawa et al. and Jeng and in further view of Lougher et al. Applicants traverse this rejection.

As previously noted, none of the cited references teach or suggest any method or apparatus to remove material from a surface of a workpiece comprising low-k material using polishing techniques. Furthermore, no combination of these references teaches or suggests “A polishing system for removing material from a wafer surface, the wafer including low-k material” or “a plurality of polishing stations, wherein at least one of said plurality of polishing stations includes a platen configured to move at about 0.8 to about 3.2 meters per second relative to the wafer comprising low-k material” as set forth in claim 12, from which claims 18, 19, 22, and 24 depend. Accordingly, claims 18, 19, 22, and 24 are patentable over the cited references and Applicants therefore request that the Examiner withdraw this rejection to claims 18, 19, 22, and 24.

Finally, claims 21 and 23 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen et al. in view of Aizawa et al. in further view of Kawamoto et al. Applicants traverse this rejection.


Claim 12 is not obvious in view of the cited references because no combination of these references teaches or suggests “A polishing system for removing material from a wafer surface, the wafer including low-k material” or “a plurality of polishing stations, wherein at least one of said plurality of polishing stations includes a platen configured to move at about 0.8 to about 3.2 meters per second relative to the wafer comprising low-k material.” Accordingly, claims 21 and 23 that depend from claim 12 are not obvious in view of the cited references and Applicants therefore request that the Examiner reconsider and withdraw this rejection to claims 21 and 23.

Conclusion

In view of the foregoing remarks, Applicant submits that the claims are allowable over the cited reference and earnestly requests allowance of all pending claims. The undersigned requests a phone call if for any reason one or more of the pending claims is considered to not be in condition for allowance.

Respectfully submitted,

Date: 4/21/03

By: 
Cynthia L. Pillote
Reg. No. 42,999

SNELL & WILMER, L.L.P.
400 East Van Buren
Phoenix, AZ 85004-2202
Direct: (602) 382-6296
Fax: (602) 382-6070
Email: cpillote@swlaw.com